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GRID FOR SOLID-FUEL BOILER
[Rost für einen Heizkessel für Festbrennstoffe]

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The invention relates to a grid for a solid fuel boiler, for central heating in particular, having a fixed bed with, for ashes or cinders, several elongate openings arranged in the form of arcs about a common center and having vibrating pins arranged in said openings, of which each pin is movable in the longitudinal sense of its opening and, for this purpose, is connected to a pin support arranged below the bed which pivots about the common center and can be moved by means of a rod, with the upper free ends of the upright vibrating pins projecting beyond the top surface of the bed.

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During operation of a solid fuel boiler an ash or cinder pile accumulates on the bed; this is for the most part broken up and dispersed with a poker so that the then smaller ash or cinder particles can fall downward through the grid openings into an ashtray or similar. The work required for this is frequently laborious and presupposes that the grid is suitably accessible from the outside, in order to be able to operate the poker.

So-called vibrating grids also are known, for which the bed as a whole, or at least the better part thereof can be vibrated from the outside by means of a bar. Since the bed, particularly for a larger furnace, has a relatively large mass, this work also is laborious, the more so since the bulk of ashes or cinders on the bed also must be moved as well. The vibrating movement of the bed frequently also has a damaging influence on ceramic material linings, chamotte in particular, provided in the region of the combustion chamber.

For a grid of the aforementioned type (DE-A 83 363), said disadvantages are eliminated by means of vibrating pins movable in the openings about a common center. In this known construction, all vibrating pins are seated on a common pin support, which, prior to initiation of the actual vibrating movement, first must be raised by pulling out a control rod, before the vibrating movement can be carried out by means of horizontally sweeping the same control bar. This has various disadvantages: First, the pin

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* [Numbers in right margin indicate pagination of the original text.]

support equipped with vibrating pins has, for larger furnace types, considerable dimensions, entailing fabrication-related difficulties. Lifting the pin support with vibrating pins often is not possible in a trouble-free manner, since at least a part of the cinder bed or firebed located on the grid also must be lifted. Moreover, attaining a satisfactory vibrating effect presupposes horizontally sweeping the rod over a large angular range, which necessitates a correspondingly large opening in the side wall of the furnace. Air can flow in under the grid, unhindered, through said opening, impairing control of the combustion. Finally, carrying out the vibrating movement is laborious for the reason that as the rod is being swept back and forth, it must be pulled out from the furnace at the same time in order to prevent the pin support from lowering afresh during said sweeping movement.

The purpose of the invention is to eliminate these disadvantages and to both simplify the manufacture of the components necessary for a vibrating movement and also to facilitate operation of the vibrating device. The invention solves this problem in that the vibrating pins adjacent to the common center and the vibrating pins further removed from said center are arranged on pin supports separate from one another, arranged one upon the other and non-movable in the height dimension, which pin supports are connected to a common operating rod of the rod for vibrating movement, which is connected eccentrically to the pin supports in an articulated manner. Such a construction preserves the advantages in the aforementioned state of the art, that the entire grid need not be moved for the purpose of attaining a vibrating movement, which signifies a protection to impact-sensitive linings provided in the combustion chamber; however, above and beyond this, partitioning the vibrating pins to two pin supports substantially facilitates the manufacture of said pin supports, particularly for larger boiler cross sections. Above all, however, said pin supports no longer need to be raised in order to be able to exert an effective vibrating movement; instead they merely are swept horizontally on a horizontal plane about the common center by means of the common operating bar. The operating rod therefore serves merely to

horizontally sweep the vibrating pin supports and no longer has to be pulled out from the furnace in order to raise said vibrating pin supports. Consequently, the vibrating pins are always ready for operation. The articulated connection of the operating rod to the pin supports enables the vibrating movement to be achieved by a simple movement of the operating rod, essentially in the longitudinal sense thereof, such that said rod can be guided easily in the boiler wall in a sealed manner, thereby preventing the inflow of leak air. /3

The upper free ends of the vibrating pins need only project slightly above the top surface of the bed. Sufficient for this is a fraction of the length of the openings, measured in the direction of passage, for example $1/10$ - $1/2$ of said length, preferably $1/6$ - $1/3$ of said length. This is sufficient in order to exert a fully effective shock load on the cinders or ashes on the grid.

It is preferable, according to the invention, for the vibrating pins to be formed of circular cylindrical pegs which move in slots of the bed that form the openings, which slots expand downward. The circular cylindrical shape of the pegs brings, on one hand, the advantage that said pegs can be fabricated economically of rod material; on the other hand, the circular cylindrical shape offers adhering cinder or ash particles the lowest possibility to form a crust. It therefore cannot come to a blockage of the pegs along the longitudinal direction of the openings, the more so since openings that expand downward promote a falling through of ash and cinder particles as soon as said particles have entered the openings.

According to an improvement of the invention, a pin support supporting the vibrating pins adjacent to the common center can be pivoted about the center by means of a vertical pivot journal mounted on the bed, whereby pivoted about the same pivot journal and arranged below the aforementioned pin support is an additional pin support, which supports the vibrating pins further removed from the center. This yields a particularly simple construction having a particularly simple to manufacture pivot mounting for the two pin supports. This pivot mounting formed by a pivot journal also can be utilized, according to an

improvement of the invention, in order to provide at the upper end of said pivot journal, a hook or ring projecting up from the bed, with which the grid or at least a portion thereof can be raised upward in the shell, e.g. for the purpose of repair or cleaning.

However, the arrangement also can be met, according to an embodiment variant of the invention, such that at least one pin support is guided in a pivoted manner about the common center by means of the vibrating pins sliding in the openings, with said pin support supporting the vibrating pins by means of a self-contained ring.

Depicted diagrammatically in the drawing is one embodiment of the invention. Figure 1 shows a grid /4 inserted in a boiler in vertical section. Figure 2 shows said grid in enlarged scale and Figure 3 is a top view of Figure 2.

Represented in Figure 1 is a boiler for a central heating, having an upright shell 1 with circular cross section which is closed at the bottom by means of a grid 2. The top of the shell 1 can be closed in a leakproof manner by means of a cover 3, which supports an inserted inspection glass 4 in order to observe combustion and a grip 5, with which the cover 3 can be opened about the axis of a hinge 6. The shell 1 is enclosed by a water-bearing inner jacket 7 having a circular ring cross section, which, for its part is enclosed by a likewise water-bearing outer jacket 8, likewise having a circular ring cross section, with, however, a ring-shaped gap existing between the two jackets 7, 8 in which is arranged a flue gas channel 9. The inner jacket 7 and outer jacket 8 are connected to each other by means of pipes 10 arranged radially with regard to the longitudinal axis of the shell 1. Connected to the upper portion of the outer jacket 8 by means of a distribution channel 11 having a circumferential progression is a recirculation port 12 for the hot water of the central heating installation. Arranged analogously at the upper end of the inner jacket 7 is a main drain 13 having a circumferential progression, to which is connected a flow port 14 which penetrates the flue gas channel 9. Provided in the bottom wall 15 of the

distribution channel 1 [sic; 11] or of the main drain 13 is a multitude of openings 16 through which water can stream, distributed in the direction of the periphery of the channel 11 or 13 into the outer jacket 8 or, as the case may be, out of the inner jacket 7. Provided analogously on the lower part of the inner jacket 7 or on the lower part of the outer jacket 8 are ring-shaped distribution channels 11, which are connected to each other by means of radial pipes 10 and the cover walls 17 of which are provided with openings 18 to allow water passage.

Flue gas enters the flue gas channel 9 through the ring-shaped gap 19 remaining between the cover 3 and upper edge of the inner jacket 7. Connected to said ring-shaped gap 19 is a first flue 20 of the flue gas channel 9, which progresses downward about the inner jacket 7 in several helically shaped passes. An intermediate wall 21 separates this flue 20 from an additional flue 22 of the flue gas channel 9, which leads to the fume outlet port 23 and at the bottom is connected to the flue 20 by means of a peripheral opening 24. The flue 22 also has several helical passes progressing about the aforementioned flue 20, which, however, lead upward from the bottom. The direction of flow of the flue gas guided in said flues 20, 22 is indicated by arrows 25; the direction of flow of the water streaming in the jackets 7, 8 is indicated by arrows 26. Therefore, the direction of flow of the water is always in counterflow to the flue gas current in the adjacent flue 20 or 22 of the flue gas channel 9. The individual helically shaped passes of the two flues 20, 22 are bordered by slanting sheet metal walls 27 which incline from the inside in an outward direction and which toward the outside leave open, in each case, a narrow gap, through which flying ash can fall into the respective pass of the respective flue 20, 22 located below. Said particles of flying ash finally reach the common bottom wall 28 of both flues 20, 22. Located in said bottom wall 28, between two pipes 10 adjacent to each other is an opening to which is connected a channel 29, through which the flying ash is conducted to an injector nozzle 30 arranged in a venturi meter 31, through which air is blown, from a blower, not represented, in the direction of the arrow 32, in

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the direction of an ash pit 33 located beneath the grid 2, from where the air reaches through the grid 2 into the shell 1. The suction effect of said air current causes particles of flying ash to be pulled out of the flues 20, 22. The intermediate wall 21 and slanting walls 27 form a cyclone crossing which is introduced between the inner jacket 7 and outer jacket 8 and expediently is employed for the purpose of cleaning and for an easier assembly from above in the ring-shape space existing between the two jackets 7, 8. In order to facilitate this, said cyclone crossing can be partitioned into individual segments in the direction of the periphery of the shell 1, the walls of which overlap in order to prevent untight areas.

At the distribution channels 11 or main drain 13, the bottom walls 15 or, as the case may be, cover wall 17 need not unconditionally be provided with openings 16 or 18. It also is possible to cut the sheet metal of said bottom walls 15 or cover walls 17 to be narrower than the channel width and to securely weld the same to only one side, either on the outside or inside, of the sheet metal of the inner jacket 7 or outer jacket 8.

The grid 2 bears on a flange 34 protruding inward from the wall of the shell and has a bed 35, which has a multitude of elongate, arched openings 36 for ashes or cinders, which progress concentrically with regard to a common center 37. Each opening 36 expands from top to bottom, with the cross section being more or less trapezoidal. This facilitates the passage of ash particles. Arranged in each opening 36 is a vibrating pin 38, which is movable in the longitudinal direction of the appurtenant opening 36. For this purpose, the vibrating pins 38 are connected to two pin supports 39, 40 arranged beneath the bed 35, with the pin support 39 being located above the pin support 40 and supporting the vibrating pins 38 adjacent to the center 37, against which the pin support 40 having a lower arrangement supports the vibrating pins 38 further removed from the center 37. The two pin supports 39,40 are mounted in a pivoted manner about a common vertical axis 41. For this purpose the center of the bed 35 supports a pin-shaped pivot journal 42 upon which are borne in a freely pivoting manner the two pin supports 39, /6

40 one upon the other by means of centered holes 43, 44. Each pin support 39, 40 has arms 45, 46 arranged in a star-shaped manner which support vibrating pins 38 protruding upward from said arms. In addition to this, the lower, larger pin support 40 has, in the area of the ends of the arms 46 thereof, arched appendages 47 Figure 3, which support additional vibrating pins 38. All vibrating pins 38 are formed of circular cylindrical pegs, the diameter of which is somewhat less than the smallest width of each opening 36, such that the vibrating pins 38 have enough play in order to be able to move in the openings 36. As Figures 1 and 2 show, the upper free ends 48 of the vibrating pins 38 project beyond the level of the top surface 49 of the bed 35, thereby ensuring that vibrating the vibrating pins 48 relative to the stationary bed 35 will cause cinders forming on the firebed to be destroyed and to fall through the openings 36 of the grid 2. In this connection, the top surface 49 can be inclined [downward] from the center 37 outward as are the ends 48 of the vibrating pins 38 in order to conduct the firebed away from the center 37 to the peripheral sections of the grid 2, where the vibrating movement of the vibrating pins 38 is stronger than in the areas adjacent to the center 37.

Serving in order to carry out the vibrating movement is a rod 50 having an operating rod 51, which is guided out of the ash pit 33, through the base frame of the boiler outward and can be operated by means of a grip 52. Said rod 51 is connected to an eccentrically arranged peg 53 in an articulated manner and secured against falling out from said peg 53 by means of a cotter pin 54. The peg 53 stands away downward from the underside of the upper pin support 39 and penetrates a bearing eye 55 of the lower pin support 40 such that the latter also is entrained in a back and forth movement of the rod 51 for a vibrating movement. The rod 51 is, with regard to the common pivot center 37, connected in an eccentric manner to the two pin supports 39, 40.

The pin forming the pivot axis 42 for the two pin supports 39, 40 has, at the upper end thereof, a ring 56, which protrudes upward away from the bed 35; said ring can be used to raise the overall grid 2, after releasing the cotter pin 54, and to lift same out of the shell 1. This facilitates assembly and cleaning of the grid 2.

The center of the lower pin support 40 has a raised appendage 57 so that the upper pin support 39 resting upon said appendage 57 is raised somewhat relative to the main portion of the lower pin support 40.

It goes without saying that vibrating pins 38 also can be provided on more than two pin supports.

The length, measured in the direction of the periphery of the grid 2, of the openings 36 increases in the direction away from the center 37 toward the periphery of the bed 35, with the arrangement expediently being met such that for a vibrating movement all vibrating pins 38 reach the end of their respective opening serving as a limit stop, essentially at the same time, such that the entire length of the opening 36 is cleaned free. For a very long opening it also would be conceivable to provide more than one vibrating pin per opening.

For large devices it is more beneficial to avoid a central pivoted mounting for the pin supports 39, 40 and to design the pin supports without such a central mounting, yet connected in a ring-shaped manner. In this connection each pin support ring is centered by means of the vibrating pins 38 which slide in openings designed concentrically to the pivot center and are guided by same.

1. Grid for a solid fuel boiler, for central heating in particular, having a fixed bed (35) with, for ashes or cinders, several elongate openings (36) arranged in the form of arcs about a common center (37) and having vibrating pins (38) arranged in said openings (36), of which each is movable in the longitudinal sense of its opening (36) and, for this purpose, is connected to a pin support (39, 40) arranged below the bed (35) which pivots about the common center (37) and can be moved by means of a rod (50), with the upper free ends (48) of the upright vibrating pins (38) projecting beyond the top surface (49) of the bed (35), characterized in that the vibrating pins (38) adjacent to the common center (37) and the vibrating pins (38) further removed from said center (37) are arranged on pin supports (39, 40) separate from one another, arranged one upon the other and non-movable in the height dimension, which pin supports (39, 40) are connected to a common operating rod (51) of the rod (50) for vibrating movement, which is connected eccentrically to the pin supports (39, 40) in an articulated manner.

2. Grid according to Claim 1, characterized in that the vibrating pins (38) are formed by circular cylindrical pegs, which move in slots of the bed (35) that expand downward, which form the openings (36).

3. Grid according to Claim 1 or 2, characterized in that a pin support (39) which supports the vibrating pins (38) adjacent to the common center (37) is pivoted about the center (37) by means of a vertical pivot journal (42) mounted to the bed (35), and in that pivoted about the same pivot journal (42) is an additional pin support (40), arranged below said pin support (39), which supports the vibrating pins (38) further removed from the center (37).

4. Grid according to Claim 1, 2 or 3, characterized in that the lower pin support (40) supports a central upward projecting appendage (57) upon which rests the upper pin support (39).

5. Grid according to one of Claims 1-4, characterized in that projecting downward away from the upper pin support (39) is a peg (53), which penetrates a bearing eye (55) of the lower pin support (40) and below the same is connected, in an articulated manner, to the operating rod (51) of the rod (50). /9

6. Grid according to one of Claims 1-5, characterized in that each pin support (39, 40) has arms (45, 46) in a star-shaped arrangement, which support the vibrating pins (38), the end regions of which [arms] are provided with arched appendages (47) supporting additional vibrating pins (38).

7. Grid according to one of Claims 3-6, characterized in that the upper end of the pivot journal (42), arranged in the center (37) of the bed (35), for the pin supports (39, 40), is provided with a hook or ring (56) projecting upward, away from the bed (35).

8. Grid according to one of Claims 1, 2, 3, 4, 5 or 6, characterized in that at least one pin support (39, 40) is guided in a pivoted manner about the common center (37) by means of vibrating pins (38) sliding in the openings (36), with said pin support (39) supporting the vibrating pins (38) by means of a self-contained ring.

FIG. 1

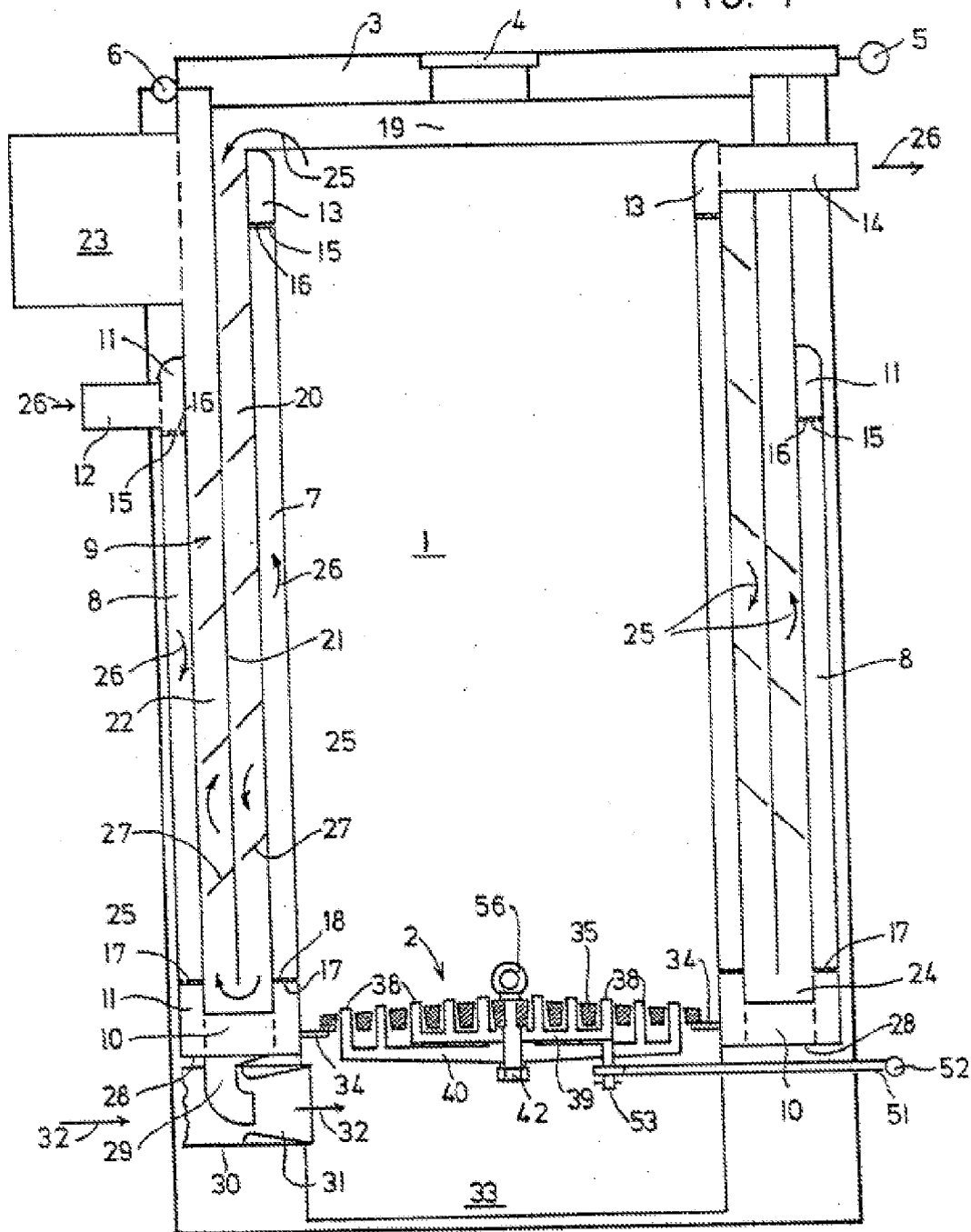


FIG. 3

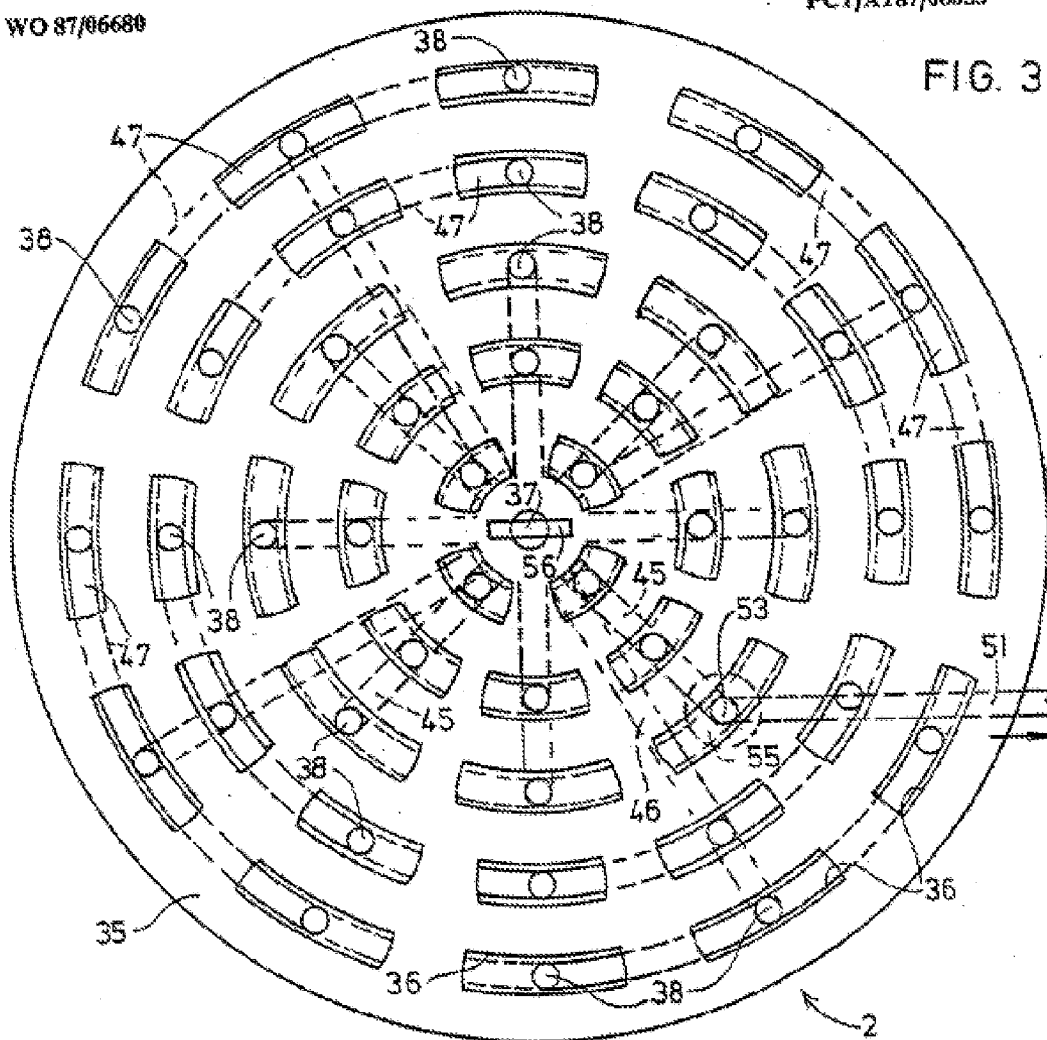
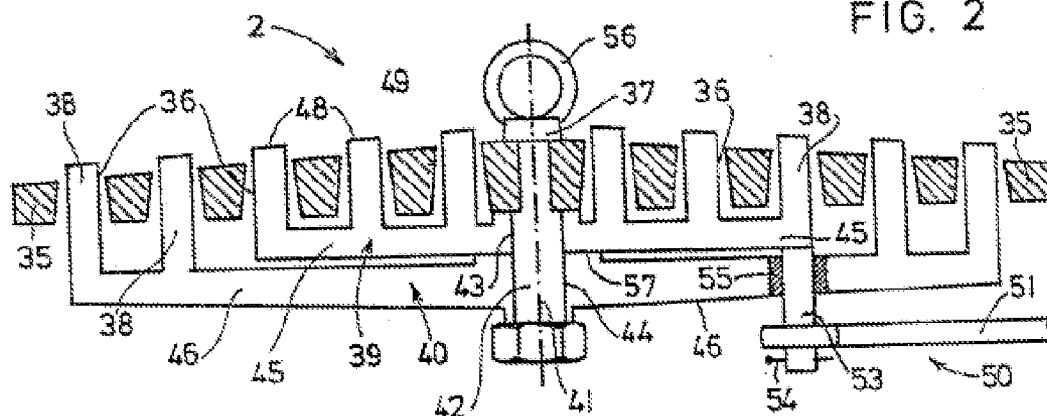


FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No. PCT/AT 87/00033

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int. Cl. ⁴ : F 23 H 15/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
Int. Cl. ⁴	F 23 H, F 24 H, F 24 B	
Documentation Searched other than Minimum Documentation to the extent that such documents are included in the fields searched *		
III. DOCUMENTS CONSIDERED TO BE RELEVANT*		
Category *	Citation of document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. *
A	DE, C, 83363 (MEYER) 3 October 1985 see the entire document cited in the application	1
A	GB, A, 652042 (HAGLEY) 18 April 1951 see page 4, lines 44-120; figures 3,4	1,2
A	GB, A 737952 (NEWTON) 5 October 1955 -----	
<p>* Special categories of cited documents: "</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"d" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search 28 July 1987 (28.07.87)		Date of Mailing of this International Search Report 18 August 1987 (18.08.87)
International Searching Authority European Patent Office		Signature of Authorized Officer

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. ECT/AT 87/00033 (SA 17024)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 04/08/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C- 83363		None	
GB-A- 652042		None	
GB-A- 737952		None	

For more details about this annex :
see Official Journal of the European Patent Office, No. 12/82